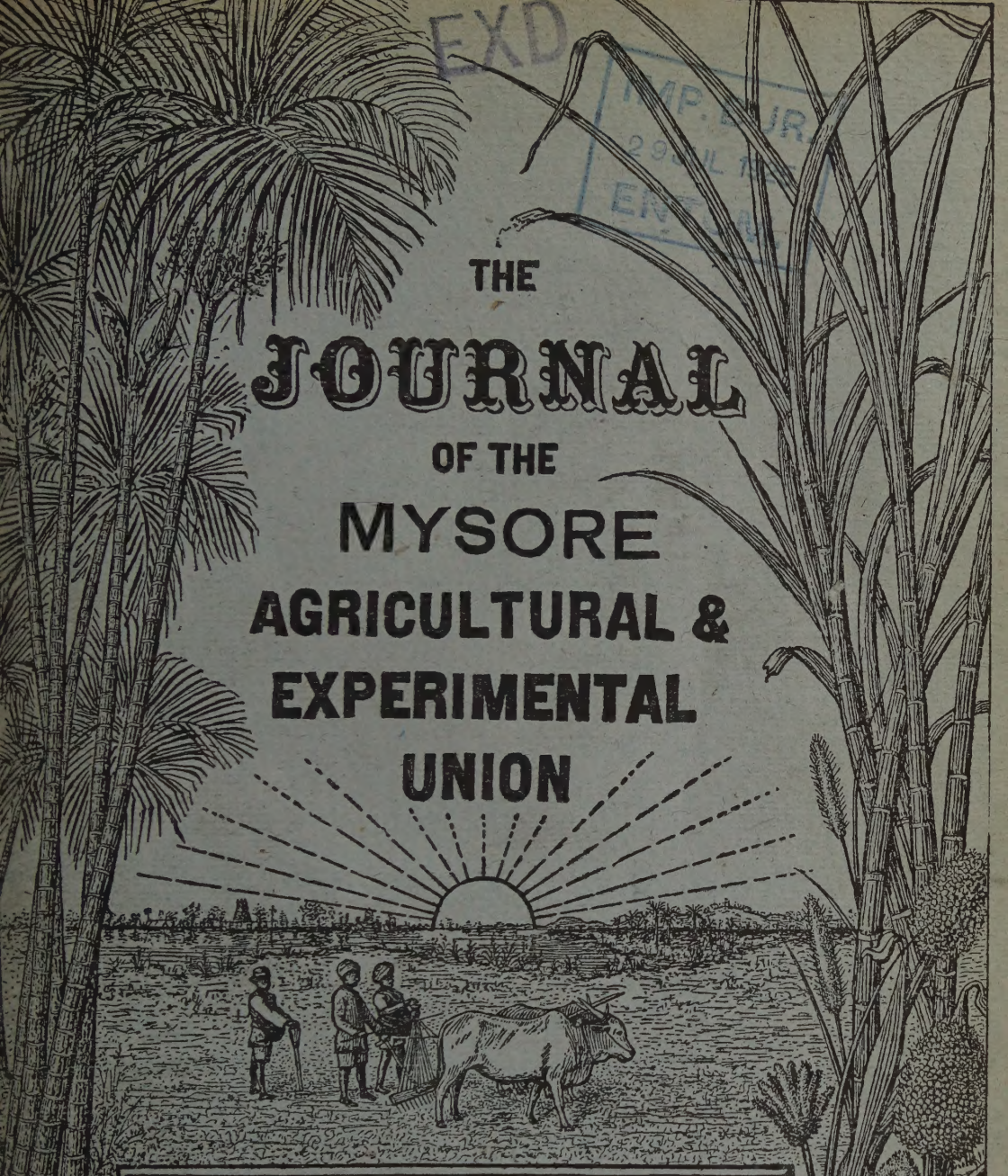
EXD
IMP. LIBR
29 JUL 19
ENTD

THE JOURNAL OF THE MYSORE AGRICULTURAL & EXPERIMENTAL UNION



Vol. VII.] 1925 [No. 1

PRINCIPAL CONTENTS.

The Introduction of Improved Implements in Mysore—By A. K. Yegnanarayana Iyer, Esq., M.A., N.D.D., Dip. in Agri. (*Cantab.*), etc.

Manurial Experiments with Paddy—By Dr. B. Narasimha Iyengar, B.A., Ph.D.

THE JOURNAL OF THE MYSORE AGRICULTURAL AND EXPERIMENTAL UNION.

A quarterly magazine devoted to the advancement of Agriculture and published by the Mysore Agricultural and Experimental Union.

Chief Editor

B. Narasimha Iyengar, B.A., Ph.D., Agricultural Chemist.

Associate Editors

K. Kunhi Kannan, M.A., Ph.D., Entomologist.
M. J. Narasimhan, B.A., Senior Assistant Mycologist.
Leslie C. Coleman, M.A., Ph.D., Director of Agriculture in Mysore.
M. G. Singarachar, B.A., A.C.E., Agricultural Engineer.
W. Davison, B.S.A., Live-Stock Expert.
N. Krishna Iyengar, B.A., Inamdar, Uragahally Estate.
Major R. W. Simpson, M.C., G.B.V.C., Superintendent, Civil Veterinary Dept.
D. G. Ramachandra Rao, Assistant Director of Agriculture.
H. Srinivasa Rao, Retired Deputy Conservator of Forests.
T. Narasinga Rao, Coffee Planter.
B. Venkatanarnappa, M.A., Professor, Central College.
K. Bhima Rao, B.A., F.C.S., Senior Assistant Chemist.
N. Rama Rao, B.A., B.L., Superintendent, Sericultural Department.

Secretary

N. Venkatsubbaya, Rural Science Supervisor.

Rates of Subscription :—

Free to members of the Union.
Rupees 3 per volume to non-members.
Foreign subscription 4 shillings.
Subscription can begin from any number desired.
Individual copies, annas 12. Foreign, 1 shilling.
Postage Extra.

Rates of Advertisement:—

	Single Insertion.	Annual. (4 consecutive numbers.)	
Full page ... Royal Octavo	Rs. 10	Rs. 32	Payable in advance.
Half page ...	Rs. 5	Rs. 16	

All communications should be addressed to the Editor, the Journal of the Mysore Agricultural and Experimental Union, Sheshadri Road, Bangalore.

CONTENTS.

Pages

The Introduction of Improved Agricultural Implements in Mysore—By A. K. Yegnanarayana Iyer, M.A., Dip. in Agri. (Cantab.), N.D.D., etc., Deputy Director of Agriculture in Mysore .. .. 1—15

Manurial Experiments with Paddy—By B. Narasimha Iyengar, B.A., Ph.D., Agricultural Chemist in Mysore .. 16—22

New Hosts for *Corticium Koleroga* (Cooke) Von Hohnel, with Some Observations on the Basidiospore Formation—By S. V. Venkatarayan, B.A., Assistant Mycologist .. 23—28

Weekly Requirements of Farm-Coolies—By K. Kunhikannan, M.A., Ph.D., Entomologist to the Government of Mysore .. .. 29—33

CORRESPONDENCE.—

Problems of Agricultural Education—Letter by K. M. Gururaja Rao, L.Ag., Farm Manager, Babboor Farm .. 34—38

The Course of Studies in an Agricultural College—Letter by Gundappa S. Kurpad, B.A., Vice-Principal, Mysore Agricultural School .. .. 39—41

NOTES AND COMMENTS.—

Spraying against Coffee Black Rot or Koleroga—Yield from Sprayed Plants—Improvement of Dairy Cattle—Organization of Manurial Experiments in Germany—Necessity of Commercial Farms—Rice Cultivation—Our District Conferences .. .. 42—47

SELECTIONS.—

The Havoc Wrought by Rats—Grafting of Vegetables—Prevention of Nitrogen Losses from Cattle Urine—Erosion and Surface Run-off under Different Soil Conditions—How America is helping the Chinese Silk Industry .. .. 48—54

The Journal
of the
Mysore Agricultural
and
Experimental Union.

Vol. VII. 1925. No. 1.

The Introduction of Improved Agricultural Implements in Mysore.*

BY

A. K. Yegnanarayana Iyer, M.A., Dip. in Agri. (Cantab.), N.D.D., etc.,

Deputy Director of Agriculture in Mysore.

The introduction of improved implements into Indian agriculture has probably been the oldest among the improvements thought of by those who have ever bestowed any attention on this matter. It has furnished the most fruitful field of activity for those engaged in the task of improving Indian agriculture and even to this day when men's ideas have undergone considerable mellowing as the result of experience and closer observation it almost continues to do so, yielding the place of honour only to the plant-breeders' work which is now the activity that over-shadows every other line of improvement. This in one way cannot but have been so, for the simple and apparently crude and primitive implements of the Indian ryot form the most striking feature of Indian agriculture ; in the minds of people used to the wonderful appliances of Western agriculture, their use excites pity mingled often with contempt, but always and certainly with hopeful enthusiasm that the road to the improvement of Indian agriculture

* Note prepared for the VII Annual Meeting held in November, 1924.

lay along on the smooth and straight path of a simple replacement of these tools by those employed in Western agriculture. The result has been that for many years, it may be truly said, the Departments of Agriculture in India were more or less machine-mad. All sorts of implements and machines were imported, which actual trials showed absolutely unsuited to the conditions of this country. In the experimental farms here and there all over the country and especially in the older ones can be seen such a collection of these machines all mouldering into slow decay that show not only how enthusiasm can run riot but also that the road to improvement lay in other directions. With the progress of time, with greater experience and more intimate knowledge of Indian agriculture, ideas of what constituted an improvement have undergone a radical change It is well to bear in mind that this greater acquaintance does not damp one's enthusiasm, does not incline one to the pessimistic view that the Indian ryot has through centuries of experience evolved the implements which suit his conditions best and that therefore the last word has been said ; on the other hand a closer experience reveals only the need and the scope for improvement that there exists, not in the sense that all human institutions are capable of improvement but in a more direct, practical and insistent manner.

Past experience has, however, amply demonstrated that the matter is not so simple as it was thought, that the attempt to replace them by mere Western implements is doomed to failure, and that implements suited to the conditions of the country possessing greater efficiency than the present ones have to be devised. It may be that slight alteration may have to be made to the existing ones, or that Western implements have to be altered so as to adapt them to the conditions here, or that altogether new ones will have to be thought of. It is seldom that a direct replacement by Western implements can meet the situation. Progress then will be the result of considerable study and patience and through failures ; in any case it is certain to be slow. There is this however to be said in mitigation, *viz.*, that conditions in Indian agriculture are not likely to change so rapidly as to make an improvement cease to be one and become out of date soon ; the elements of permanency are great enough to justify a slow and steady pace.

The general condition of Mysore agriculture bearing on this

particular subject which is more or less well known may be summarised thus :

Mysore agriculture is small scale farming : it is a land of small farmers, the average holding being only about $6\frac{1}{4}$ acres in extent. The peasantry is poor, the average earning is low and so is the standard of living. About 7 per cent of the cultivated area is under wet and garden cultivation where the fields are very small indeed or the conditions preclude anything but hand tools or the smallest of bullock-drawn implements. Holdings consist of scattered fields and are very seldom in one single compact block. Agricultural labour is on the whole cheap, for though money wages have greatly increased they have merely kept pace with the increased value of produce and can scarcely be considered to afford anything more than the merest subsistence. The ryot continues exceedingly averse to move out of the villages and labour is thus not sufficiently mobile to avoid congestion and flow where it may be wanted.

As against these features it should be noted that the number of large landholders is not inconsiderable, for the holders of land of above 100 acres is about 4,000, of whom about 1,000 own more than 500 acres.

The predominant type of cultivation in the State is dry land farming, wet cultivation and garden cultivation of the kind referred to merely amounting to about 7% of the cultivated area. Dry land fields are quite large as a general rule while on the black cotton soil areas the fields are strikingly so, fields of 5 to 15 acres being not at all uncommon, features which favour the use of good and efficient implements which will quickly cover a large area. Quick and safe means of transport, combined with the general onward trend of prices, are bringing about a steady increase in the price of produce of all kinds with an added irresistable stimulus to increase the area under money crops. This enhancement in the money return from the land forms indeed the most striking feature of present-day agriculture. Though to the mere wage-earner this has meant little, to the owners of land and more especially to the actual farmers it has been acting as the most powerful ameliorant ; apart from the outward signs of a higher standard of living which is quite noticeable everywhere and which it has rendered possible, what concerns us most here is the increased capital which is placed in the hands of the ryot to be used

either as a reserve against bad times or as working capital for a better form of agriculture.

It may also be noted that notwithstanding the rooted and strong aversion of people to leave their villages, labour is being increasingly attracted to the towns and other centres of industry or for better-paid forms of agricultural work. These are tending, if not to produce any noticeable depletion of labour in the village, at least, to making labour not as plentiful as it was.

Before taking up the various implements in use in the State individually we may note here their general characteristics. The implements and appliances in use are in the first place many and varied, quite contrary to the belief commonly expressed that the plough is about the only implement of the Indian ryot. In Mysore at any rate there is hardly a single agricultural operation which has not its own appropriate distinctive implement. Next is their cheapness and the simplicity of construction ; for even the best of them are mere arrangements of rough hewn wood and strings and bamboos, leather, iron, or like permanent material being kept down to the barest and most indispensable minimum. Nothing moreover is used that cannot be replaced quickly and at almost no expense, out of materials locally available or repaired by the ryot himself or the village blacksmith and carpenter. They nevertheless display great ingenuity and judged by the condition for which they are adapted, they are remarkably efficient. For instance who amongst us has watched these simple and crudely constructed tools, the bladed harrow, *kuntes* of various sizes working, without being struck with the marvellous efficiency of their simple design ; who again has contrasted the simple seed drill of the Mysore ryot with its ponderous counterparts of Western agriculture and their elaborate mechanism and wealth of working parts and materials, without a feeling of admiration for the ways of the Mysore ryot ; or who again has witnessed the *kapile* lift and compared it with the various efforts at its improvement, not one of which successfully competes with the simple *kapile*, without a feeling of respect for old world talent ?

We shall now take up the principal implements and examine the scope and need for improvements reviewing at the same time the work done so far. The plough is of course the foremost agricultural implement and any improvements therein will be of the widest application

affecting each and every agriculturist. The ploughs used in the State are not all of them of the same pattern ; quite a number of types can be seen ; in the matter of size alone there are all grades from the light paddy land ploughs to the heavy black cotton soil plough used for the eradication of *hariali* grass and requiring from 3 to 4 pairs of strong bullocks for working. The shape and manner of the working parts differ considerably from one tract to another. But all types are built upon one and the same general principle, *viz.*, the breaking of the soil being effected by the peculiar V shaped plough bottom, in great contrast with the rectangular furrow made by ploughs of the European pattern. The result is that the actual ploughing of the land takes an unnecessarily long time, because a thorough breaking of the soil to a uniform depth is not possible without repeating the ploughing three or four times. It is true that thereby some of the subsequent operations like the use of the cultivator or harrow can be reduced, but it is obviously uneconomical to use the plough for an operation which can be done much more quickly by the cultivator or other suitable implement. This is the most important item of improvement, *viz.*, the introduction of the mould board plough. With the comparatively large areas of dry land possessed by most ryots and the need for taking advantage of suitable moisture conditions when they last, this improvement becomes imperative. Fortunately in Mysore the ryot has set his seal of approval on this improvement, for it is not untrue to say that the mould board plough is more largely in use in this State, taking area for area, than in any other part of India.

Having created this appreciation of the value of this improvement, further efforts lie in the direction of removing some of the drawbacks of this type of implement. The favourite general purpose mould board plough is, as you all know, the Kolar Mission plough which is the light American plough, lightened still further, to adapt it to our conditions. Its chief drawback is the rapid wear of the plough share which costs about Rs. 3-8-0 and seldom lasts for more than six acres, after which it has to be replaced by a new share. This high cost of replacement is certainly a serious drawback of these ploughs even in the country of their origin, it is much more so in a poor country like ours. Attempts to remedy this defect by the Department have been several ; cheaper cast iron shares have been tried, shares with a

replaceable point called slip point shares have been tried, and again ploughs with bar point shares ; all of these however have met only with partial success. The ryot would still prefer the K. M. plough and the entire share, regardless of cost, murmering no doubt but paying nevertheless, thus demonstrating unmistakably his appreciation of a good article. The bar point model, however, suggested a new line of improvement, *viz.*, a combination of the lightness and efficiency of the K. M. type, with the bar point feature of the barshape plough. The result has been the Mysore plough now being made after design, which has been tried and tested not only by the Department but also by many of the members of this Union. It is too early to say anything about the popularity of this type ; for only a very small number of them have been manufactured and supplied so far. All indications, however, point to the fact that a good plough which at the same time materially overcomes the drawbacks of the K. M. type has been designed. Much in approval will no doubt be heard from members in the course of the ensuing discussion and probably something to the contrary also.

The question of the cost of implements both the new model and the K. M. plough as well as that of the share not only of the latter but of the other types of ploughs sold by the Department, is a matter requiring attention. Their present cost is decidedly high and a material reduction is urgently called for if we wish to introduce the implements in any large number. Whether it be by local manufacture or by direct dealing with the makers abroad, the guarantee of a large sale, or a subvention in the initial stages, it is needless here to detail, but the matter is one for urgent and serious consideration. The most material point to remember here is that the mould board plough has been taken up by the Mysore ryot, which is half the battle won. Should we succeed in replacing the entire number of the wooden ploughs in the State, there would be about 4½ lakhs of improved ploughs in the State with an annual sale of about one-fifth of that number or about 90,000 ploughs. If we cheapen them materially we shall hasten the day when we can see this consummation.

Before leaving the subject of ploughs we may refer to the problem of the black cotton soil and as somewhat connected therewith the subject of tractor and other engine-drawn ploughs. I have often doubted if the mould board type of ploughs is such a great advantage

on the black cotton soil as it is on the red soils. On the black cotton soils the furrows are never clean and clear cut and the wedge-shaped plough bottom of the heavy wooden plough does not leave any pronounced ridge between one furrow and another as it does on a red soil, reducing to that extent the advantages possessed by the mould board ploughs. I am referring here only to the *type* of the plough and not to the *material* of which it is made, for in that respect the iron plough scores. Furthermore the mould-board style of ploughs does not throw the strain equally on both bullocks of the team, for one of them has always to walk on the clods, while the other has the easy job of walking on natural ground. A turn-wrest arrangement is an advantage under these circumstances.

The problem of eradication of *hariali* on the black cotton soil by giving it a deep ploughing in the hot weather is an important one in cotton tracts and it is here that the use of tractors or ploughing engines assumes practical importance. We may, therefore, state the whole case as regards the use of such outfits in this country. Being large scale implements, the outfits can be thought of only when large individual holdings are to be handled or where holders could be prevailed upon to club together for the purpose. As far as the size of the fields to be ploughed is concerned the ordinary dry land fields in the State are large enough and do not preclude ploughing by their size. As regards destruction of *hariali* on the black cotton soil by means of hand labour only a small area can be worked, and even that at great cost and trouble ; with bullock-drawn ploughs too the work is too exacting and slow, though the cost is considerably less. With the Fowler ploughing tackle it has been demonstrated that the work can be done very much quicker and moderately cheaply also. Even a tractor-drawn plough has been demonstrated to do a good job on such soils though not ploughing to the same depth, at a comparatively small cost.

On the red soils for the ordinary ploughing such outfits are rarely in need, as the ordinary bullock labour of the villages is generally sufficient. But there are special cases where land may need to be ploughed or disked quickly over a large area. Can it be done more cheaply than with bullocks ? As far as *ploughing* is concerned we may answer, no. But I feel hopeful that a good disking amounting practically to a ploughing with country plough can be done cheaper than

with bullocks. It may not however always be a question of cheapness, for it is possible that the work may be too slow or too strenuous, or the requisite bullock power may not be forthcoming at the required time, when the tractor outfit will meet the case. The unfortunate thing about this matter is that the work which was well begun all over the countries has not been continued for various reasons, the foremost among them being the folly of the makers not arranging for a prompt service of spare parts. The fact that in any case the use of engine-drawn ploughs will be only for the purpose of meeting a special case and is not of general application as in the case of the improvements in the ordinary bullock-drawn ploughs, also serves to keep it in the back ground. More trials are however needed and the work is one which only the Departments can take up.

Passing on to the other implements of tillage, it may be said on the whole that there is quite a variety of local implements for this purpose that serve the purpose cheaply and efficiently. In the *dodkunte* especially and with its variations there is an admirable type of implement with which preparatory tillage operations subsequent to ploughing can be carreid out so as to cover a large area quickly and thoroughly, and a very desirable improvement for the present will be the introduction of the implements into tracts where they are unknown. In the six-shovel cultivator being supplied by the Department there is great economy of time, for as in the case of bladed *kuntes*, the implement covers many times more ground than the plough, which is the implement used at present for these complete range of preparatory operations prior to sowing.

A set comprising an improved plough and a cultivator or a *dodkunte* will speed up preparatory tillage very materially indeed without its being beyond the resources of the ordinary ryot. As time goes on it is probable that metal will be substituted for wood, of which they are now so largely composed, for such substitution by more permanent material of many articles in use by the ryot as a sign of the times ; thatch, wicker, earthenware and wood are all giving place gradually to suitable better material. It may be a desirable improvement if the present six-shovel cultivator itself be altered so as to have a metal frame which will also have the advantage of rendering the blades easily detachable for replacement whenever necessary.

Leaving the implements of preparatory tillage we may now pass on

to the seed drill. As already stated Mysore has several types of drills ; all are based on the general design of a seed bowl or hopper at the top and furrow-opening tines at the base, connected to the hopper by tubes which pass the seed through. The advantages of sowing in lines as with a seed drill, in preference to broadcasting the seed, are more or less well-known throughout the country, and the tracts noted for their high class cultivation all possess drills of one type or another and in forms suited to different crops. An extension of the practice into tracts where it is not in vogue will be a desirable line of activity for the Department. In what respects the drill itself can be advantageously improved may now be considered. Firstly, the present type of drill depends largely upon the skill of the person who is actually feeding the seed into the hopper for its proper work. Seed is sown evenly, at the proper rate, and with no blanks, *only if the person is well trained, and careful*, otherwise the work is poor. Secondly, there is always the risk of the tines becoming choked with earth leaving blank rows, which are discovered only after the seeds sprout ; if the soil should be even slightly wet this risk is very much greater. In certain tracts, drills may however be seen, which get over this difficulty, by making the tines serve only the purpose of furrow openers ; they are not to pass the seed through for which other provision is made. Such drills are also as a rule made to sow wide rows ; the introduction of these drills more widely will be an advantage. The first difficulty *viz.*, that of even and skilful sowing, however, is present in all the types and can be got over only by a radical change in the construction. Provision will have to be made for some kind of transmission of power, which in all the appliances with the ryot is applied direct. A suitable arrangement will have to be devised in which the exact mode of making use of the forward motion of the implement to feeding arrangement in the hopper should be of the simplest kind. Such a drill will, I think, find a ready welcome and will be widely taken up.

Of interculturing and weeding implements there is also a great variety of both hand tools and bullock implements. I would draw attention to the excellence and the superiority of the bladed *kunte* type like *hathikunte*, and recommend their introduction into places where they are unknown. In the eastern districts it is all but unknown, where it offers therefore wide scope for popularization. A combination of the bladed *kunte* with a ridging arrangement to be used between

rows of young sugarcane, whereby both the interculture between the rows of cane and ridging up of the rows on either side will be a great labour-saving arrangement where sugarcane may be grown at all largely ; I designed an implement of the kind for use on the Nagenahalli Farm, but the nature of the small terraced fields peculiar to this farm has precluded its use with advantage. Some of the types of the Planet Junior Hoe and garden implements deserve mention as desirable introduction in sugarcane cultivation. While on this subject of intercultivation, mention may be made of the idea of using only one bullock for some of these implements ; the idea is not, I think, fantastic, for interculturing implements are usually quite light in draft, and even now the double bullock team is hitched to two or even three *yede kuntes*, to make full use of the power. Furthermore a single bullock arrangement can be used between rows of crop after they are grown too high for the double bullock arrangements. With a suitable yoke and a trained bullock, there is certainly room for economy ; a hitch of this kind exhibited by the Bombay Department of Agriculture in one of our Dasara Exhibitions in Mysore was tried, but the jingle and clatter of chain and leather frightened the bullock so much, that the trial afforded more merriment than instruction. It is certain that with a trained bullock, the arrangement will be found a useful innovation.

Before proceeding to harvesting tools and those for the preparation of produce we shall look into that most important appliance, *viz.*, the water-lift. As you know, the local appliances for lifting water are two-fold, *viz.*, the piccotah which is the manual power-lift and the *kapile* which is the bullock-power lift. Both are almost perfect and each meets cheaply and efficiently the conditions for which it is designed. The first one indeed is pronounced to be incapable of improvement as far as the efficiency goes. Frequent inquiries are however made in regard to chain pumps, manual-power suction pumps and the like, but for irrigation purposes under conditions such as the piccotahs are installed in, it will be hard to find a better substitute.

As regards the *kapile*, many improvements have, as you all know, been attempted, chiefly with a view to ease the bullocks by avoiding the travel up and down the steep ramp, or the walking backward which is necessary in the *kapiles* of certain districts. A circular track on the

level for the bullocks to walk on is what has been attempted. Improvements in the type of *banies* or buckets have also been designed ; even a Persian wheel arrangement called " Noria Lift " has been tried. But none of them evidently possesses the many-sided advantages of the *kapile*, which holds the field altogether and to the exclusion of every one of the so-called improvements.. Latterly we have had the Ramachandra Lift, which is claimed to do the work more cheaply and with only a single bullock. Tests have also been reported in support of the claim ; it has also dispensed with the leathern *bani*, which is also a recommendation because leather has of late become a great source of expenditure with the ordinary *kapile* ; it possesses also other metal fittings especially the pulley, which is also a good feature. The ordinary *kapile*, however, has stood the test of time and the rough and poor conditions of the village, and it is doubtful if other lifts possess this characteristic. Nevertheless in view of the good features about the Ramachandra Lift, it deserves a wider trial.

Engines and pumps have certainly scope for profitable use in several parts of the State, on the banks of the rivers and in the case of the large irrigation wells in the eastern taluks. The high price of crude oil and the lack of prompt technical assistance have hampered the movement. A promising line of activity is the installation of small units of electrically-driven pumps at convenient centres along the power lines, which, after the recent extensions, traverse a big stretch of country. Centres from where the current could be tapped, the price of such pumping units, the running cost and other particulars will have to be gone into and the facts given publicity ; there is good scope for the use of such outfits in the case of crops grown intensively and without much bullock labour, such as mulberry, potato, vegetables and the like.

We shall now pass on to harvesting tools. The harvesting season is always one which the ryot looks forward to with anxiety. In the case of ragi, the chief food crop, it happens that the harvest has to commence before the rains of the North-East Monsoon are over and such break as there may be has to be made use of quickly and fully. The crop of the whole village comes to maturity simultaneously and though men, women and children turn out for work, even in the case of a moderate crop, few villages are self-sufficient in their labour requirement for harvest and outside labour will have to be employed, while

if the crop should at all be good, harvest is delayed owing to want of sufficient labour. Wages rule high and may be said to be quite double the usual rate for ordinary agricultural labour. The sickle nevertheless continues to be the sole harvesting tool, though the process is almost as slow as if the man had no tool at all and used only his hands and pulled out the plants. It is also curious that at no place does there exist even a crude attempt at improvement which is not the case with the tools we have been describing so far. In Europe and America, the sickle has given place to the scythe, the scythe again to the reaper, and the reaper to the self-binder which makes as perfect a job of harvesting as it may be possible to do. This progress has not altogether been the result of a dearness of labour, for you will read of accounts of labour having been thrown out of employment and of widows and orphans having been deprived of their bread, of hatred and strife and of an angry peasantry wrecking these pernicious innovations much in the manner of what we read about the cotton operatives in Lancashire when first the spinning jenny was invented. Conditions of rural life are so different here that there has been no incentive to any improvement and a happy peaceful state of affairs has prevailed. Though no one wishes to disturb this happy family, yet some improvement, some quicker harvesting arrangement, is desired by the ryot himself. It is when you come to think of improvements in harvesting methods, you realize how closely the various factors in our rural economy are interdependent, hanging together so to speak. You cannot alter one link without having to alter at the same time various other adjustments in the scheme. For instance, we cannot introduce a harvesting machine of any pretensions, unless we give up the practice of growing an *akkadi* crop along with our ragi crop. The avare, togari, fodder jola, niger, pundi and the other miscellaneous lot of subsidiary crops grown in the *akkadi* will have to be sown separately and to that extent agricultural methods will have to be altered. Preference again will have to be given to the stiff-strawed varieties, with compact earheads which stand knocking about without shedding the grain. Further even the mere "Reaper" without any attachments is a heavy machine and in any case will require quicker-moving animals than the ordinary lot of bullocks. Not that suitable gearing is not possible, but I mention the details to show in how many directions adjustments are called for. Progress

therefore must necessarily be slow ; but rapid harvesting appeals so strongly to the ryot that the various adjustments necessary will be made, as the work becomes sufficiently known. A beginning was made by importing a Rajah Reaper, fitted with the needful gearing to suit it to bullock draft, and some demonstrations were also conducted, but we did not persist. It is certainly beyond the dreams of the wildest optimist to think of the self-binder ever coming into use in South Indian agriculture. it is a far cry from the sickle to the binder ; but with some effort, we can, I think, usher in at least a simple type of reaper, with considerable chance of success.

Coming to threshing appliances, the story is rather interesting, because the ryot is everywhere giving up his time-honoured method of threshing and taking up in a most astonishingly rapid manner the new method of threshing by the stone roller. No stimulus, no persuasion is needed, only he has to see it with his eyes to realize that he should possess a roller of his own. The stone threshing roller shares with the iron sugarcane mill and I may add the Kolar Mission plough the honour of affording unmistakable proof that the ryot will not hesitate to change his methods radically, if he is convinced. It knocks the bottom out of the theroy of the unchanging East and all that. The roller is now used for all sorts of grains and pulses and the man who still has to thresh his grain under the feet of cattle feels himself left out and very old-fashioned.

The Department at one time demonstrated the use of a regular threshing-machine run by a bullock gear at first, and later by a small oil engine, with some amount of success. The machine did not stand the battering involved in transport on country roads and as no new one was got out, the work stopped. It is somewhat large for individual ownership, save in the case of large landholders and as in the stone threshing roller—itself a great improvement on the old method—a popular implement suitable for even the generality of the farmers was found, the threshing-machine has more or less cooled off. But if any one wants to see what it can do and of what great advantage it can be, I would recommend him to visit Mr. N. Krishna Iyengar's estate at Uragahally at threshing time.

A certain amount of attention has also at one time been devoted to the supply of a small winnower and a few were in use by the ryots here and there. An indoor appliance of this kind, which will obviate

the weary waiting upon the wind and bright weather, is a desirable introduction and enquiries are received now and again. It is also reported that a large number of such winnowers are in common usage in the Central Provinces, having been introduced by the Local Department of Agriculture. Although the Mysore ryot has quite a variety of useful and clever little threshing-floor appliance for winnowing and cleaning grain, the fact that the regular winnowing machine will do all these in one operation and more expeditiously, while at the same time making the work independent of the weather, does not fail to appeal to the ryot.

Next to threshing appliances, the sugarcane mill is the most important among the appliances for rendering produce ready for the market. Reference has already been made to the cane mills in another connection. I cannot help calling to mind the astonishment I felt when I first saw the remains of a ponderous old wooden sugarcane mill, and wondered how it was possible anybody could say anything in its favour as against the iron mill and how anybody could have hesitated to scrap it without a moment's thought. And yet it did not pass into oblivion without a struggle. The iron mill was said to yield jaggory detrimental to health, jaggory was of poor quality, the crushed cane was no good for rope making, the village carpenter lost his occupation and so on, these were all adduced against the iron mill at the time. None hears them now, and the old mills themselves cannot be seen outside of a museum, if even there ; a memory of these incidents ought to hearten up any budding inventors among our young members against discouragement by opposition and adverse comment.

In the Nahan type of sugarcane mill which the Department is popularizing, we find features superior to other types in use in the State, and the only remark I would make in regard to it by way of departmental action is local manufacture, a material cheapening of the mill and a satisfactory service of spare parts. This matter is however receiving attention and tests are being made at several places of the mills made in the Government Workshop. Much should be possible in this direction, in conjunction with the Government Iron Works.

A portable milling outfit comprised of an engine and a small mill, such as is used in the Hebbal Farm will also be welcomed in many tracts, especially in years when the tanks may have filled and paddy

and sugarcane cultivation may be possible, for then the bullock power of the village will not be enough to supply the requirements of the milling house and the field and one or other would suffer. The power outfit will afford great relief in situations of this nature.

Another implement which has occupied some attention in the State is the chaff-cutter. Here too there are several interesting local devices, especially in the jola tracts. Some of the imported types are also in use here and there. The matter of providing a suitable type of chaff-cutter will assume some further importance as our work in popularizing silage making develops. The heavy-bladed type, working nut-cracker fashion, which is in use in certain parts of Shimoga and Chitaldrug, may be a good type to adopt and improve.

Before closing I shall just touch on the problem of areca shelling. The shelling is now done by methods familiar to you all. It may be noted, however, that in the present method, both shelling and slicing are done in one operation, the method is certainly slow and when the season is in full swing, it is seldom possible to cope with it satisfactorily. A mechanical sheller is often inquired about and it may be recalled that both local and foreign inventive talent has tackled the problem. One model was actually manufactured and put out for trial. I watched it at the time and can only say it did not do the work. It was intended to be only a sheller, but very few of the nuts were shelled neatly, many were jammed, some were left unshelled or partially shelled and practically every nut was bruised ; the principle however on which the machine was designed to work was good and possibly with further experiment and study can be improved into a satisfactory machine. The subject certainly deserves attention, for the scope for the useful employment of a good machine is very great.

From the foregoing review it would be clear that the question of improved implements is not a simple matter. It requires careful study and extended trials, by men possessing a close acquaintance with local agricultural practices assisted by a competent mechanical engineer. The need again for close and continuous attention and not mere spasmodic efforts is also indicated.

Manurial Experiments with Paddy.

BY

B. Narasimha Iyengar, B.A., Ph.D.,

Agricultural Chemist in Mysore, Bangalore.

For some time past the Department of Agriculture has been advocating the use of manures known as "Paddy mixtures", which usually contain an oil-cake or sulphate of ammonia as the source of nitrogen, ordinary super-phosphate or fine steamed bone-meal as the source of phosphoric acid and small amounts of sulphate of potash whenever necessary. The amount of such mixture to be applied and proportion in which the ingredients are to be mixed depends upon the nature of soil and the amount of cattle manure and green manure usually available for application to the lands in question.

To get some idea as to the general manurial requirements of paddy and the relative availability of various nitrogenous and phosphatic manures, a set of pot experiments were started early in 1923. The soil used was a fairly stiff clay from a bit of waste land near the bed of the Hebbal tank. After mixing the soil with the necessary manures and filling it into pots in the usual way followed in pot experiments. 34 days' old seedlings of Chintamani Sanna Bhatta were got from the Hebbal Farm and transplanted into the pots in exactly the same way as such transplanting is usually done on paddy fields. Twelve seedlings were transplanted into each pot and all possible care was taken to imitate as far as possible field conditions with regard to supply of water to the crop. The whole crop did not mature simultaneously and so the harvest took place on various days between 8th May and 26th June, 1923.

The plan of experiments together with average yields from 4 similarly treated pots is given in Table 1. Without entering into a very detailed discussion, the results may briefly be summarized as follows :—

(*a*) That there has not been an adequate response to potash manuring.

(*b*) That the use of phosphatic manures enhances the utilization of nitrogenous manures, thereby showing a deficiency of phosphate in the soil used.

(*c*) That super is superior to bone-meal as a source of phosphoric acid.

(*d*) That undecorticated safflower cake is not so readily available as either groundnut or castor cake.

The effect of phosphates on plant growth was very striking and it was rather difficult to convince visitors that all plants had been transplanted on the same day and treated exactly alike in every other respect.

A series of field experiments was started on the Marthur Farm in 1922. The area selected consists of 36 plots and each plot is 1/40 acre in extent. The soil is of the usual lateritic nature found in the Malnad. The plan of experiments together with results obtained during 3 seasons is given in Table 2, and below are given only the average figures for 3 seasons. It may be mentioned that each treatment has been repeated on three different plots situated in different parts of the experimental area and the results given for each treatment are the averages of three such repetitions in each case.

Series	Treatment	Yield in lbs. per acre	
		Grain	Straw
I.	(*a*) Only cattle manure ..	1309	1853
	(*b*) Cattle manure *plus* 100 lbs. sulphate of ammonia ..	1469	2111
	(*c*) Cattle manure *plus* 100 lbs. sulphate of ammonia *plus* 280 lbs. super ..	1660	2287
II.	Cattle manure and 420 lbs. super.—		
	(*a*) 100 lbs. sulphate of ammonia	1315	1638
	(*b*) 150 lbs. ,, ,, ..	1435	2013
	(*c*) 200 lbs. ,, ,, ..	1598	2189
III.	Cattle manure and 150 lbs. sulphate of ammonia.—		
	(*a*) 140 lbs. super ..	1446	2036
	(*b*) 280 lbs. super ..	1542	2222
	(*c*) 420 lbs. super ..	1511	2186
IV.	Cattle manure and 420 lbs. super.—		
	(*a*) 250 lbs. groundnut cake ..	1409	1858
	(*b*) 375 lbs. do. ..	1542	2204
	(*c*) 500 lbs. do. ..	1651	2284

It will be seen from figures given in Table 2 that maximum yields have been obtained in all the years by the application of 100 lbs. sulphate of ammonia and 280 lbs. superphosphate to the acre. Taking the results as a whole, the indications are that manures applied beyond 100 lbs. sulphate of ammonia and 140 lbs. superphosphate to the acre have not in any way contributed to increase in yields. Hence the experiments are being remodelled using still smaller quantities of these two manures.

Comparing the sulphate of ammonia series with oilcake series in which both these manures have been applied on the nitrogen basis, it will be seen that groundnut cake is not much behind sulphate of ammonia as a manure for paddy and the choice between the two must depend on the price per unit of nitrogen in each.

Experiments on lines similar to the above, but only with half the quantity of manure used for plots in series I on the Marthur Farm, and also trials with various paddy mixtures were started on the Hebbal Farm in 1923-24. The maximum cost of manure including potash does not exceed Rs. 16-8-0 per acre.

Each treatment has been repeated at least 4 times on different plots and the average yields from such similarly treated plots during the first season of experiment are tabulated below :—

Treatment	Yield per acre in lbs.	
	Grain	Straw
Only cattle manure ..	2314	2730
Do. *plus* sulphate of ammonia ..	2417	2735
Do. *plus* sulphate *plus* super ..	2440	2910
Do. do. do. *plus* potash	2537	2800
Do. ..	2347	2933
Green manure *plus* groundnut cake *plus* super ..	2250	3975
Do. do. *plus* bone-meal ..	2170	2880
Do. *plus* honge cake *plus* super ..	2405	2995
Do. *plus* castor cake *plus* super ..	2715	3910
Do. do. *plus* bone-meal ..	2555	3345

A detailed discussion of the results is postponed till the experiments have run through 3 seasons at least. The indications at present seem to be in favour of potash manuring, and the use of a paddy mixture consisting of castor cake and super.

Experiments with different doses of a paddy mixture consisting

of 200 lbs. groundnut cake and 160 lbs. ordinary super are being carried out on the Nagenahalli Farm. The soil is not a typical paddy soil, but more or less gravelly in nature. The results so far available are given below :—

Treatment	Yield per acre			
	1922-23		1923-24	
	Grain seers.	Straw lbs.	Grain seers.	Straw lbs.
No manure	1140	3140	1171	3530
Paddy mixture—360 lbs. to the acre	1260	3770	1484	4437
Paddy mixture—720 lbs. ..	1550	4690	1538	5033
Paddy mixture—1080 lbs. ..	..	..	1637	5477

N.B.—*Variety of paddy used for experiment was Pattasamanahalli Sanna in* 1922-23 *and Kaddi paddy in* 1923-24.

After subtracting the cost of manure from the value of increased yield obtained in 1923-24 the application of a single dose of paddy mixture resulted in a net profit of Rs.26 an acre, whereas the increased doses gave only Rs. 24 an acre. Though the triple dose of paddy mixture did not give a proportionately large profit, yet its application resulted in a 50% increase in yield of grain as well as straw.

Another series of experiments was carried out on the Babbur Farm in 1922-23 on a block of 4 acres of land. Here too the land is not an ideal paddy one, more or less gravelly in nature and inclined to be saline as well in parts. The manures tried were 140 lbs. bone-meal, 180 lbs. groundnut cake and 50 lbs. sulphate of potash per acre in suitable combinations. Each treatment was repeated on at least 4 different plots and the results obtained are as follows :—

Treatment	Yield of grain per acre.
No special manure ..	1300 seers.
Cake *plus* bone-meal ..	2100 seers.
Cake *plus* bone-meal *plus* potash ..	1500 seers.

The maximum yield was from plots manured with cake *plus* bone-meal alone. After deducting the cost of manure, the net profit came to about Rs. 30 an acre.

Taking into consideration all the above results, large scale field experiments to serve the purpose of a demonstration also at the same time were undertaken in 1924-25 on a plot of 25 acres near Hampapur.

the landlord himself generously consenting to bear the entire cost of manure. The land has been newly brought under irrigation and for want of sufficient quantities of farmyard and green manure the yield from 25 acres amounted to only 6,400 seers of paddy in 1923-24. The same area under manurial treatment in 1924-25 gave an yield of 19,400 seers of paddy with its corresponding increase of straw as well. The yield had more than trebled itself. The cost of manure applied worked out to Rs. 25 an acre or Rs. 625 for the whole area. The value of increased yield of grain alone was about Rs. 1,100 thus bringing in a profit of nearly Rs. 500 in addition to the value of increased yield of straw.

The trials were conducted on 26 plots varying in size from 20 to 74 guntas. Of the area to which manure had been applied, about 324 guntas or slightly over 8 acres had to be treated as non-experimental area for the reason that the line of demarcation of the application of various mixtures was not clearly defined. The results of the experimental area proper are given in table below :—

Manurial treatment and dose per acre.	Area in guntas.	Yield per acre in lbs. Grain.	Yield per acre in lbs. Straw.	Remarks.
Groundnut cake 250 lbs.				
Acid super 150 ,,	252	1420	1278	Average of 5 repetitions.
Groundnut cake 250 ,,				
Basic super 150 ,,	245	1627	1408	,, 7 ,,
Honge cake 500 ,,				
Acid super 150 ,,	115	1377	1119	,, 3 ,,
Castor cake 500 ,,				
Acid super 150 ,,	74	1816	1596	,, 2 ,,
Groundnut cake *plus* acid super 600 ,,	25	1958	1736	,, 1 ,,
Groundnut cake *plus* acid super 800 ,,	24	2088	1875	,, 1 ,,

Taking the effect of various mixtures on the crop, it is seen from the table that castor cake mixture has produced a maximum yield of 1,800 lbs. or 1,000 seers of grain to the acre. Next in rank is the mixture of basic super and groundnut cake and honge cake mixture with acid super stands last on the list.

Coming now to the varying doses of groundnut cake and acid super mixture applied, the yields do show a response to increasing doses of mixture applied, but the response to the first increase in dose has been more than that due to the second increase of 200 lbs. to the acre. As there were no parallel plots laid out for the purpose, the results cannot be taken as conclusive.

The work done amply demonstrates the utility and profitability of the use of artificial manures in areas newly brought under irrigation and where the supply of farmyard and leaf manure is scarce.

The lands having been cultivated on the share system, the profits of the landlord have been materially reduced as he had to bear the whole cost of manure, whereas his ryots got a good profit without any investment on their part. Anyhow that is a matter to be mutually agreed upon between the landlord and the tenant.

TABLE I.

Showing results of pot experiments with paddy.

Pot Nos.	Treatment	Yield in grams. Straw	Grain
97—100	No manure	22.75	9.30
101—104	Sulphate of ammonia only	15.25	..
105—108	Dried blood only	43.00	..
109—112	Groundnut cake only	54.50	31.63
113—116	Safflower cake only	45.88	29.25
117—120	Castor cake only	65.25	56.38
121—124	Only super	39.25	34.25
125—128	Sulphate of ammonia and super	118.25	103.25
129—132	Dried blood and super	87.83	73.05
133—136	Groundnut cake and super	110.63	85.30
137—140	Safflower cake and super	89.50	78.63
141—144	Castor cake and super	120.25	88.23
145—148	Only bone-meal	36.00	26.40
149—152	Sulphate of ammonia and bone-meal	63.05	..
153—156	Dried blood and bone-meal	62.00	42.50
157—160	Groundnut cake and bone-meal	77.25	55.50
161—164	Safflower cake and bone-meal	60.75	60.68
165—168	Castor cake and bone-meal	81.75	83.63
169—172	Super and sulphate of potash	43.25	26.10
173—176	Sulphate of ammonia, super and sulphate of potash	127.75	102.25
177—180	Groundnut cake, super and sulphate of potash	111.13	100.50
181—184	Bone-meal and sulphate of pota h	29.75	17.00
185—188	Sulphate of ammonia, bone-meal and sulphate of potash	50.25	..
189—192	Groundnut cake, bone-meal and sulphate of potash	84.50	44.00

N.B.—Plants manured with sulphate of ammonia or dried blood alone or with sulphate of ammonia and bone-meal had not yet formed grain when the other series were harvested.

TABLE 2

Giving Results of Paddy Manurial Experiments on the Marthur Farm.

Yield of Crop in lbs. per Acre.

Treatment	1922–23		1923–24		1924–25		Average for three Seasons	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
Check plots	1560	1920	1373	1866	993	1773	1309	1853
100 lbs. ammonium sulphate	1640	2280	1693	2293	1073	1760	1469	2111
,, *plus* 280 lbs. super	1920	2520	1813	2720	1247	1620	1660	2287
420 lbs. super & 100 lbs. ammonium sulphate ..	1320	1640	1466	1746	1160	1527	1315	1638
,, and 150 lbs. sulphate of ammonia ..	1560	1920	1653	2306	1093	1813	1435	2013
,, and 200 lbs. sulphate of ammonia ..	1760	2280	1800	2733	1233	1553	1598	2189
150 lbs. ammonium sulphate and 140 lbs. super ..	1640	2240	1426	1880	1273	1987	1446	2036
,, ,, and 280 lbs. ,, ..	1800	2680	1640	2186	1187	1800	1542	2222
,, ,, and 420 lbs. ,, ..	1720	2440	1573	2213	1240	1907	1511	2186
420 lbs. super and 250 lbs. cake	1440	1920	1506	1880	1280	1773	1409	1858
,, and 375 lbs. ,, ...	1640	2400	1706	2266	1280	1947	1542	2204
,, and 500 lbs. ,, ...	1560	2160	1866	2520	1527	2173	1651	2284

N.B.—The whole area including the check plots received a dressing of cattle manure. Jaddu paddy was used in all the three seasons, transplanted in 1922-23 and 1924-25, but broadcasted in 1923-24.

New Hosts for *Corticium Koleroga* (Cooke) Von Hohnel, with Some Observations on the Basidiospore Formation.

BY

S. V. Venkatarayan, B.A.,

Assistant Mycologist.

Since the publication of the bulletin on Coffee Koleroga*, certain facts have come to light which might prove of some interest to coffee planters and scientific workers engaged on this line of work. From the literature so far published, the fungus has been noticed on eleven other host plants, all of them belonging to the group of the dicotyledons and a good number of them belonging to the natural order *Rubiaceae*, the natural order to which coffee belongs. This would seem to indicate that the fungus is not specialized in the matter of its parasitism like the rusts or the mildews. In fact among the rusts and mildews the specialization is so advanced that one species or strain of fungus infects only one particular species of host plant, so that the safest method of identifying the fungus is by inoculation experiments. It does not seem to be so with regard to *Corticium Koleroga*. The range of hosts is wide enough to justify the fungus apparently being called an omnivore, the only limiting factor in this case being the moisture content of the air. I have found the fungus on two species of ferns growing on the coffee plants themselves in an estate near the foot of the Bababudan hills. The estate was in a semi-abandoned condition which accounts for the presence of the ferns. The ferns were growing on the stumps mixed up with a matrix of mosses which served to fix the ferns as well as to store water for them. The species of ferns in question are *Pleopeltis linearis*, Bedd. and *Niphobolus fissus*, Bedd. (Plate I). For the identification of these species I am greatly indebted to Prof. J. F. D. Almeida of St. Xavier's College, Bombay. The fungus grows on these ferns in exactly the same way as on the coffee. The mycelium is hyaline, superficial and present only on the under-surface of the sporophylls. As a result the infected leaf begins to rot, by first turning brown and ultimately black. The presence of a thick matting of stellate hairs on *Niphobolus fissus* does not seem to interfere with

* L. C. Coleman, M. K. Venkata Rao, and M. J. Narasimhan : Black Rot or Koleroga of Coffee in Mysore. Mycological Series Bulletin No. 5, 1923.

the development of the fungus, except for the fact that the growth is a little slower perhaps than on *Pleopeltis linearis*. It is not possible to be certain on this point for though in nature, under the same climatic condition prevailing in the same estate, the fungus was noticed on these two plants on different dates yet in cross-inoculation experiments to be referred to later, both the ferns were found to develop symptoms in more or less the same time. The disease on the ferns was noticed fairly late in the season, after it had appeared on the coffee, so that it is not possible to say what influence the presence of these ferns in the neighbourhood would have on the incidence of Koleroga on coffee. Whether the fungus develops on the alternate hosts first or on coffee first, it is certain that these alternate hosts have an important bearing on the progress of this disease. It is just possible that abandoned coffee estates are a great source of infection not only on account of the infected coffee but also on account of the numerous infected subsidiary hosts that are likely to be present in them.

To find out whether the fungus on coffee is similar to that on the ferns as well as on other known host plants, some cross-inoculation experiments were planned during the rainy season of 1924. Infective material in the form of entire leaves was freshly taken from the plants during the rain, so that a certain amount of sterile condition was obtained and carefully tied up with twine to the leaves of the plant in question. Care was taken to see that the under-surface of the infective material was in contact with the under-surface of the leaves of the recipient plant. The experiment was done with the two ferns *Pleopeltis linearis* and *Niphobolus fissus* mentioned, with *Canthium parviflorum* and with coffee (Plate II).

Fig. 1

Corticium koleroga on *Pleopeltis linearis* Bedd.

Fig. 2

Corticium koleroga on *Niphobolus fissus* Bedd.

Note the web of the fungus proceeding from the base of the stalk to the tips of the leaves. In Fig. 1 it is white in the two right side leaves. In the other leaves it is not distinguishable except by a change to a darker colour of the leaves. In Fig. 2, the web may be faintly seen in the first leaf from the left side (reader's left).

It will be noticed from the data that infection begins from 2 to 4 days from the date of tying infective material. The result depends upon satisfactory moisture conditions. Heavy rain does not seem to be necessary, as, after the first set of experiments on the 14th July, very heavy rain fell on 15th and yet the infection in the experiments of the previous day manifested itself only side by side with the set of experiments on the next day following that of heavy rain. As to the infections themselves all were successful except the one where a cluster of *Pleopeltis linearis* was placed amidst the leaves of another cluster of *Pleopeltis linearis* growing attached to a rock. The leaves in this case were not tied together. But this does not seem to be quite necessary as in the case of a branch of *Canthium parviflorum* placed amidst the branches of another plant of *Canthium parviflorum* infection resulted. These experiments have proved that the Corticiums on the ferns, coffee and *Canthium parviflorum* are one and the same. Mr. M. J. Narasimhan (p.8, Koleroga Bulletin) has been able to trace the infection from the leaves of Jasminum sp. twining round coffee stems on to the coffee leaves. It is possible that the Corticiums on other host plants are also the same as this, but experiments should be made before coming to a definite conclusion.

The diversity of habit of this fungus is further obvious by its capacity to infect in several places in the Shimoga malnad, the bamboo (*Dendrocalamus*, Kan. Bidaru) a monocotyledon. The symptoms are the same as in the other cases. The discovery of this host plant is due to Mr. M. J. Narasimhan. He has found the characteristic sterigmata and basidiospores of the fungus on the bamboo. He has also found an additional host plant for the fungus in *Lawsonia alba* (Goranti Gida), at Kuntgodu, Sagar.

I have been able to confirm the observation of Dr. Coleman and others in page 6 of their bulletin, that "The formation of basidiospores is of a very short duration". I observed the basidia beginning to form on 16th July 1924. The basidiospores had developed on 17th and they were to be found in plenty on 18th, and 3 subsequent days. On 22nd July they had decidedly diminished in number. As I was not able to extend my observations to the following days the exact period through which the basidiospores last could not be determined. It seems likely that the basidiospores are formed in two or three flushes

depending upon the rains and also that with the progressive development and spread of the fungus from one plant to another, the basidiospores persist for periods of from 10 to 15 days at a stretch. As recorded in the bulletin on Coffee Koleroga, Mr. M. J. Narasimhan found the basidia forming on the 18th June and noticed basidiospores till the 6th July succeeding on "most of the affected leaves from all over the estate". It is natural to expect that the disease spreads from one portion of an estate to others, so that when basidiospores ceased to form in one portion they began just to make their appearance in another. Hence the total period of 19 days during which the basidiospores were observed does not represent the period of life of basidiospores in general, but the entire period during which basidiospores may be formed in the plants of any one locality. My own observations were confined to a limited area of one estate with particular reference to a set of plants and the results showed that basidiospores were in abundance for 4 days after which they began to decline in number. As to the supposition that the basidiospores are formed in 2 or more flushes the fact that Mr. M. J. Narasimhan observed them from the 18th June to the 6th July and that I observed them from the 16th July onwards seems enough to justify it. It may be argued that this will depend on the locality and upon the weather conditions. Since his observations and mine were confined to the same district and since I also observed the earliest signs of Koleroga on 18th June (although, of course, in a different year) the differences could not have been very great between the two years nor between the two localities. The basidiospores were not searched for earlier than the 14th July as the spraying work was in full swing.

In connection with the hunt for basidiospores, it would be easy if a ready method were available, by means of which to distinguish the mycelium upon which basidiospores have developed, with the naked eye from the yet young mycelium. In fact, such a method exists although no reference has been made to it in previous literature. The Corticiums belong to the order Hymenomycetes of the class Basidiomycetes and are characterized by the presence of a hymenial layer which bears the basidia. The basidia in *Corticium Koleroga* are formed in very large numbers, packed closely together, so that the hymenial layer is felt-like. When the hymenium has fully developed the mycelium appears outside to be thicker, more whitish, and slightly

granular after the manner of powdery mildews.* Moreover, this mycelium does not wet as readily as the young mycelium, so that in a heavy rain the basidiospore bearing mycelium will remain whitish whereas the young mycelium will be transparent. This feature of the hymenium has always served as a sure test, as in all those leaves showing this appearance the basidiospores were found in abundance, and in others the basidia were not found at all. This perhaps ensures that the basidiospores remain a longer time attached to the sterigmata than would have otherwise been the case, for the hymenium if it were wetted easily sheds the basidiospores. Besides, the hymenium, after the basidiospores have been formed, becomes extremely fragile. A touch with the point of the needle or scalpel easily separates a portion of it from the general hymenium, whereas the young mycelium is tense, and to separate a portion of it for miscroscopic examination, it requires to be cut with the scalpel.

Summary.

1. Two ferns, *Pleopeltis linearis*, Bedd. and *Niphobolus fissus* Bedd., have newly been observed to get infected with *Corticium Koleroga*. Cross-inoculation experiment with the fungus on these two hosts and on the coffee all gave positive results. Cross-inoculation with the fungus on *Canthium parviflorum*, a previously recorded host, and on coffee, also gave positive results.

2. Two other host plants, namely bamboo (*Dendrocalamus*, Kan. Bidaru) and *Lawsonia alba*, have been added to the list of hosts.

3. The observation that basidiospores live only for a short period has been confirmed. An easy method is described by which to distinguish the basidiospore bearing mycelium from the young mycelium.

* Erna Schenck, ("Ueber das Auftreten either einer *Hypochnus* art auf Zuckerruhe". Centralblatt fur, Bakteriologie. Ab. 2. Bd. 61, 11-18 S. 317-322. 1924) describes a similar condition for *Hypochnus* (*Corticium*) on Sugar beet. The following passage occurs in the Review of Applied Mycology, Vol. 3, part 12, December 1924:—"The fertile parts of the mycelium on the underside of the leaves were perceptible to the naked eye by their granular or pulverulent appearance. This was due to the development of short small-celled lateral branches, profusely ramified and forming small tufts which arose from the main hyphae. The enlarged terminal cells of these branches became basidia, on which were formed four sterigmata, from each of which a spore was abstracted.

Weekly Requirements of Farm-Coolies.

BY

K. Kunhi Kannan, M.A., Ph.D.

Entomologist to the Government of Mysore.

The accompanying list of purchases made at the local shandy by coolies on the Babboor Farm may prove of interest to readers of the *Journal*. The daily wage for an adult labourer on the farm is 6 annas, for women and children 3 annas. They are expected to work for six days in the week but through illness or more often laziness, a large number stay away for a day or two each week. The procedure adopted to collect the data was as follows:—The coolies on their way back from the shandy were asked to go to the office where the contents of their baskets were inspected and the amount paid on each ascertained. Information obtained in regard to the amount spent on drink was not forthcoming in many cases but in regard to the rest of the items it is absolutely reliable. It will be noticed that salt is not among the articles obtained by many. This is because a number use only the earth salt prepared locally. This salt is said to cause minor skin diseases but is nevertheless preferred on account of its cheapness. The statistics give but a rough idea of the standard of living of the labourers but if they could be collected regularly for four or eight weeks in succession they would afford ample material for reliable conclusions to be drawn. This is not of course possible for one who visits Farms at long and irregular intervals but for those who are permanently stationed there or who have permanent labour on their estates it would be a most interesting and instructive diversion. The list is given to stimulate the interest of such in the collection of these interesting data. I should like to express my appreciation of the facilities given by Mr. K. M. Gururaja Rao, the Farm Manager, for collecting the data.

P. Lakshma—One Man.		Rs.	A.	P.
1. Rice	3½ seers.	0	10	6
2. Bottle Gourd		0	3	9
3. Dry Cocoanut	1 „	0	1	6
4. Cocoanut Oil	¼ „	0	1	0
5. Fried Gram		0	2	0
6. Toddy		0	12	0
Total ..		1	14	9

	Rama—2 People.		Rs.	A.	P.
1.	Rice	2½ seers	0	8	0
2.	Ragi	11 ,,	1	0	0
3.	Wheat	1 ,,	0	3	0
4.	Dall	1 ,,	0	3	0
5.	Cocoanut oil		0	1	0
6.	Gingelly oil	½ ,,	0	2	0
7.	Cocoanut	1 ,,	0	1	6
8.	Onions		0	0	6
9.	Green Chillies		0	1	0
10.	Spices		0	2	0
11.	Arecanut		0	2	0
12.	Tobacco		0	0	6
13.	Sweets		0	1	0
14.	Sambrani		0	0	6
		Total ..	2	10	0

	M. Shawariah—2 People.				
1.	Ragi	22 seers	2	0	0
2.	Rice	1¼ ,,	0	4	0
3.	Navane (Italian Millet) ..		0	4	0
4.	Dall		0	3	0
5.	Dry Cocoanut		0	1	6
6.	Castor Oil		0	1	0
7.	Green Chillies		0	1	0
8.	Fried Gram		0	3	0
9.	Jack Fruit		0	1	0
10.	Tobacco and Nut ..		0	2	0
11.	Cocoanut		0	2	8
		Total ..	3	7	2

	Lakma—4 People.				
1.	Wheat	1 seer	0	3	0
2.	Gingelly Oil		0	1	6
3.	Sweets		0	2	0
4.	Green Chillies		0	1	0
5.	Meat		0	1	0
6.	Nut	½ ,,	0	2	6
7.	Spices		0	2	0
8.	Mirrors 2		0	2	0
9.	Panche 1		1	0	0
10.	Tata Mill Panches 1 Pair ..		3	0	0
11.	Coat 1		1	3	0
		Total ..	6	2	0

M. Jumla—4 People.			Rs.	A.	P.
1. Navane (Millet)	..	7 seers	1	0	0
2. Rice	.. ..	5 ,,	1	0	0
3. Ragi	.. ..	11 ,,	1	0	0
4. Dall	.. ..	1 ,,	0	3	0
5. Green Chillies	.. ..		0	1	0
6. Onions	.. ..	1 ,,	0	1	0
7. Nut	.. ..	¼ ,,	0	1	3
8. Spices	.. ..		0	2	0
9. Sweets	.. ..		0	2	0
10. Match-box	.. ..		0	0	6
11. Mutton	.. ..		0	8	0
		Total ..	4	2	9

Jayaram—2 Men and 2 Boys.					
1. Ragi	.. ..	22 seers	2	0	0
2. Dall	.. ..	2 ,,	0	8	0
3. Bengal Gram	.. ..		0	3	0
4. Dry Cocoanut	.. ..		0	1	6
5. Salt	.. ..		0	1	6
6. Spices	.. ..		0	4	0
7. Kerosene Oil	.. ..		0	1	6
8. Tobacco	.. ..		0	1	6
9. Cocoanut Oil	.. ..		0	1	0
10. Onions	.. ..	2 ,,	0	2	0
11. Garlic	.. ..	1 ,,	0	2	0
12. Vegetables	.. ..		0	3	0
13. Soap	.. ..		0	1	6
		Total ..	3	14	6

Honnara—3 People.					
1. Tamarind fruit	..		0	0	6
2. Chillies	.. ..		0	0	9
3. Cocoanuts	.. ..		0	2	6
4. Bottle Gourds	.. ..		0	2	0
5. Tobacco	.. ..		0	1	4
		Total ..	0	7	1

Syed Hussain and two girls.					
1. Rice	.. ..		1	8	0
2. Dall	.. ..	1 seer	0	3	0
3. Gingelly Oil	.. ..		0	3	3
4. Ghee	.. ..		0	6	0

				Rs.	A.	P.
5.	Chillies	½ seer		0	0	9
6.	Spices			0	3	0
7.	Cocoanut			0	1	3
8.	Vegetables			0	2	0
9.	Kerosene Oil			0	1	6
		Total .		2	12	9

DHARMIA—4 PEOPLE.

1.	Ragi	12 seers		1	0	0
2.	Millet	7 ,,		1	0	0
3.	Rice	2½ ,,		0	8	0
4.	Dall	1½ ,,		0	4	0
5.	Bengal Gram			0	1	0
6.	Bottle Gourd			0	3	0
7.	Cocoanuts 4			0	6	0
8.	Salt			0	1	0
9.	Onions			0	0	6
10.	Kerosene Oil			0	1	6
11.	Tobacco			0	2	0
12.	Cloth ½ yard			0	5	0
13.	Spices			0	1	0
14.	Nut			0	2	0
15.	Beedi and Match-box ..			0	3	0
16.	Tape			0	2	0
		Total ..		4	8	0

DAKEE—3 PEOPLE.

1.	Ragi	11 seers		1	0	0
2.	Navane (Italian Millet) ..	7 ,,		1	0	0
3.	Rice	2½ ,,		0	8	0
4.	Bengal Gram ..	2 ,,		0	5	0
5.	Vegetables			0	3	0
6.	Onions			0	1	0
7.	Chillies			0	0	3
8.	Dry Cocoanuts 2 ..			0	3	0
9.	Salt			0	2	0
10.	Jaggery			0	10	0
11.	Mutton			1	0	0
12.	Fish			0	3	0
13.	Cocoanut Oil			0	1	0
14.	Eatables (Sweets) ..			0	2	0
15.	Gingelly Oil			0	1	0
16.	Kerosene Oil			0	1	3

			Rs.	A.	P.
17.	Betel-leaves and Nuts ..		0	4	0
18.	Panche		1	4	0
19.	Beedi and Match-box ..		0	1	6
		Total ..	7	2	0

DHARMAVARADA RAMA—2 PEOPLE.

			Rs.	A.	P.
1.	Rice		1	0	0
2.	Ragi		1	0	0
3.	Bengal Gram	½ seer	0	1	6
4.	Salt		0	1	0
5.	Dall		0	2	3
6.	Lime		0	0	4
7.	Vegetables		0	2	0
8.	Tamarind	½ seer	0	0	6
9.	Cocoanuts 2		0	2	0
10.	Eatables (Sweets) ..		0	2	0
11.	Tobacco		0	2	0
12.	Nuts		0	1	3
13.	Sambrani		0	0	1
14.	Betel-leaves		0	1	0
15.	Spices		0	2	0
16.	Dry Chillies		0	1	3
		Total ..	3	3	2

CORRESPONDENCE.

To

THE EDITOR,

THE JOURNAL OF THE MYSORE

AGRICULTURAL & EXPERIMENTAL UNION,

BANGALORE.

Sir,

The public should feel grateful for your having opened the pages of your Journal for a discussion of the problem of Agricultural Education. This is a problem which, so far, has not been successfully tackled, not, surely, because it is unimportant,—for who can say this of our basic industry, agriculture ?—but because it is such a complex problem which, for successful solution, impinges directly on politics, sociology and economics and requires the handling of not mere educationists but statesmen and economists, as well.

The problem of Agricultural Education may be divided into three main phases. First is the problem of attracting the right sort of men for training. It is a well-known fact that students who seek admission into agricultural institutions are not from agricultural classes. This has for its bearing, the growing disaffection among agriculturists for the profession. I cannot do better than quote in this connection what an eminent writer on economy says :—

"The slow and moderate return on capital invested in agriculture is one cause of this disaffection. Whosoever follows any vocation solely for the amount of money it may yield, can exercise his powers to that end in many other ways better than in agriculture. The Hebrew, that unswerving scenter-out of gain, never is a husbandman. The homage paid to wealth in the Northern United States for the last quarter of a century, has turned into wages, most productive of gain, the greater part of young men, whose career is generally determined by the common ideal.

Another cause of disaffection towards agricultural life is its isolation. The young people envy the easier intercourse of the town, think their own life dull and want to live where it is not so lonesome. The day labourer in a great town may fare better, find better schools

and dearest of all, behold a thousand times more of the passing show, than the small agricultural proprietor in a remote country region. A man, who had served at different times as valet, waiter, barber, usher and what not, was heard to say that in case of need, he would do anything except work on a farm. It was living, as he would have said, "out of the world", away from the novelty of fashion and excitement, the only world he would appreciate.

A further cause of disaffection towards agricultural life, is the growth among us of physical squeamishness and tenderness of the person—a disposition to avoid contact with nature in the gross with whatever is short or rank or rugged. It is probable that more young men to-day would rather hire themselves out to stand behind counters or to sit in boxes selling tickets, than to become foremen to farm proprietors on their own account. It is largely because of the more polished appearance, which they are enabled to affect and readiness to endure those things which offered man's spirit, rather than those that offend his body.

Still another cause for dissatisfaction towards agriculture as a vocation is the decreased importance of the agricultural population, socially and politically, as compared with the members of other professions. The farmer's local influence is less than that of the trader, manufacturer or contractor. He who in numbers and in proportion of taxes is first, is, for all purposes of official distinction, considered the least. All roads towards distinction lead away from the farm. Aware of his diminished consequence in the world of politics and affairs, the farm proprietor emulous of distinction, if unable to forsake it himself, desires that his sons shall follow almost any calling other than his own."

I have quoted the above to show that the problem of attracting the right sort of men is not so easy of solution as it at first sight appears. To direct the financial stream to help the rural uplift in the shape of colonization schemes, land mortgage and co-operative banks, increased facilities for education and a cheap and efficient system of administering justice available in the villages, is the problem that awaits solution at the hands of statesmen.

The second phase of the problem is the adjustment of the curriculum of studies to suit our conditions. There is a growing tendency in the courses of study to make fetish of the modern branches

of agricultural sciences, to the detriment of agricultural technique. To quote Sir A. D. Hall, "Agriculture is a subject, *sui generis*, something quite distinct from an applied science. It has its own technique and methods and its own fundamental science which is neither chemistry, botany, nor zoology, nor anything of the kind termed science. It is this aspect of the education that lacks enthusiastic handling in our institutions. When we consider that our agriculture is one of the oldest in the world and is the result of or protracted processes", covering over centuries, and methods, though empirical, are full of results, I feel the need to emphasize on making the course comprise more the teaching of agricultural technique than those sciences which in spite of their being modern, play a subsidiary part in making agriculture successful. There would be few to contest the fact, that the productions of our agricultural colleges are of a high scientific value, but incapable of being transferred to rural canvas. A course that would fit into the scheme of rural conditions is the real desideratum. The education must be given in a rural setting stripped of its urban influence. There is this difficulty, I admit. Since the teaching of sciences like chemistry, botany, etc., necessitates having well-equipped laboratories, it would be well nigh impossible to make them thrive in a rural atmosphere. But this difficulty does not seem to me to be insuperable. The course may comprise, as usual, of these sciences to begin with, say for a year or year and a half, during which period it would be possible also to teach the theory of agriculture with the aid of an experimental farm. The course afterwards is continued on a large business farm, where the students are made to learn that the several sciences they have been taught are only handmaids to the principal figure, farm management, or the business side of the farm. In so far as there are no such farms owned by private gentlemen it is incumbent on the Government to have a farm answering to these needs. It must be noted in this connection, that the farm must be a model farm, run purely on business lines. I am particular about this, as I feel, that there is a growing volume of public opinion that the Government farms under the screen of conducting experiments are a huge waste of public money. I realize, that a farm that eschews all experiments is unthinkable in this progressive world, as progress, with agriculture, has its foundation on experiment. But such experimental farms should be worked

separate and must be kept as 'field laboratories' with an eye to research and should not be mixed with model farms, with disastrous results both to research and business. I believe that since experiments will have to form part of the work even of a business farm, as for instance in testing different varieties of seeds, manures, etc., such experiments on a business farm should be kept under control with an eye mainly to business. These experiments will serve only what a small laboratoy does in a big industrial concern, working out the problems that arise in handling the farm from a business standpoint. To make it clear there must be two different kinds of farms, one purely experimental tackling agricultural problems in plant-breeding, manurial requirements of crops and such like and the other run purely on commercial lines as a model farm. A model farm, as I have suggested, will serve two purposes. The students that are trained on such a farm may be expected to realize well the rural conditions, and grasp better the problems of agriculture. Secondly the effect it will have, in turning back to land the attention of most of the capitalist absentee landlords will be marvellous if we should prove by tangible results that agriculture may be made to pay a decent income in addition to contributing a healthy and peaceful life. To me it seems almost incontrovertible that men trained for a couple of years on such a farm are more useful, being better equipped, to the country than those that are turned out of an experimental farm where the idea of business, in its relation to agriculture, has absolutely no chance for growth. After all, does not successful agriculture mean increased money return and if this is conceded, why think of bringing up the future farmers of the country in an uncongenial atmosphere ?"

There is then the problem of providing successful men turned out of the college, with employment. This seems to be the deciding factor in devising the course of education. Some are for opening fresh avenues in Government service and say if the Agricultural Department is small, why not absorb them into the Revenue Department. In all this I fail to see one thing and that is, is all this costly long course to fit one for Government service ? It is easy to understand the arts courses so moulded as to suit Government Recruitment. It would be unworthy of the name of technical education if successful men, after a full term of arduous training should be made to look to Government jobs as their crowning achievement.

Government service is a poor hope at best and any attempt to draw a large number of candidates with Government service as the bait, is, to my mind, unworthy of the great cause of agriculture. What the country requires is well-trained, sturdy, self-willed men to do the pioneer work in rejuvenating the agricultural industry and leave behind them a heritage pregnant with possibilities and not surely, men, who, though, with a bigger load of scientific knowledge at their back, look to an easy, assured income under Government patronage.

This leads to, I am afraid what many fear, the prospect of having half-empty classes. I fully realize that we are in an era of mass-production, but I cannot close my eyes to the fact that though the mass-produced Ford has caught the market, the costly Rolls-Royce has not lost world admiration. Our experience of agricultural education so far should have taught us this : that the majority of those who had the opportunity of passing through agricultural institutions successfully are either in Government service or, outside service, in any profession other than agriculture. I would appeal to those who want full classes with the uncertain bait of Government service dangling before the pupils' eyes, to weigh calmly and decide whether they would prefer a few well-trained men, strong in their confidence and wedded to the profession they have chosen or a large number of indifferent sort, who not being confident of their own ability, catch at every straw that is blown towards them. The former may be expected to form a nucleus round which will grow agriculture, which will be the pride of the nation. The latter will meet with their inevitable doom " Failure ". It behoves the educationists, therefore, that, since agricultural education concerns the improvement of the oldest and the most important of our industries, great consideration should be given to make the course useful, by making it most practical and even difficult, if necessary, for is it not wisely said that " practice must be harder than use ".

Some points have been raised in this letter, which require further elucidation and I hope to dilate on these in an article which I expect to contribute shortly.

I am,
Yours faithfully,
K. M. Gururaja Rao.

To

THE EDITOR,

THE JOURNAL OF THE MYSORE

AGRICULTURAL & EXPERIMENTAL UNION,

BANGALORE.

Dear Sir,

Allow me to make a few remarks about an Agricultural College in Mysore, in view of the rumours current about the early establishment of such an institution. Two points which I have mentioned in an article of mine in your Journal, I must emphasize. One is that the Agricultural College should be located away from big cities, so that students study and live in a truly agricultural atmosphere. This is absolutely essential if we expect to turn out real agriculturists. This seems to have been realized and acted upon in the United States of America, and the example of Massachusetts may be taken and the agricultural activities of the University be located in a thoroughly rural area. The second point that I would stress is that the College should not be mixed up with a State Experimental Farm. Certain experimental work will have to be undertaken and a fairly extensive area must be available for both this and the necessary practical work for all the students of all classes.

A few words may not be out of place about the course of studies itself. The State Department of Agriculture will naturally look to the College to provide recruits for both the Executive and Research sections. The qualifications of men recruited to these sections are such that a certain provision will have to be made to meet the special needs of these two sections. For the Research branch, a working knowledge of the methods of Research in a practical subject will be essential and for the Executive branch, a more intimate knowledge of the Economics of Agriculture and the Agricultural practices of the State will be necessary in addition to proficiency in the technique of Agricultural Research. Assuming that a course extending over four years is adopted for a degree in Agriculture, for students who have passed their University Entrance or an equivalent examination including "Science" subjects, a syllabus somewhat on these lines may be followed :—

FIRST YEAR.

1. Agriculture :—Soils, implements, tillage, irrigation.

2. Practical Agriculture :—Work of all farm implements and machinery.
3. Animal Husbandry :—Dairying, feeding, breeding sheep, poultry, bees, etc.
4. Chemistry :—Elements of Organic Chemistry, manures and their application, methods of analysis of soils, manures, milk, etc.
5. Engineering :—Surveying, workshop practice.
6. Botany :—General Morphology and Physiology, identification of plants.

SECOND YEAR.

1. Farm Crops, Agriculture :—Farm Economics, improvement of Crops, Horticulture.
2. Practical Agriculture :—Extended tours in the State in addition to farm work.
3. Animal Husbandry :—Animal diseases and remedies. Judging cattle.
4. Engineering :—Engines and machinery. Farm buildings, roads, fences, etc.
5. Entomology and Mycology :—Pests and diseases.

THIRD AND FOURTH YEARS.

Devoted to specialization in Agriculture including Agronomy and Farm Economics or any one of the following :—Agricultural Chemistry, Agricultural Engineering, Agricultural Botany, Entomology, Mycology, Animal Husbandry.

There will be examinations at the end of the 1st, 2nd and 4th years. It may be made obligatory that for a degree, a student must obtain a pass in all the examinations. For the Final Examination, a student might be asked to take one Major and one Minor subject.

The part-time system could be introduced into the scheme, all the students specializing in Agriculture spending some time on the various farms, during their tours in the third year, and in the final year being stationed for one complete season at various farms according to the nature of the training required to be given.

This scheme would provide adequate training for all needs

mentioned before and would be capable of expansion in any desired direction. It does not seem to me to be advisable to divorce Research work from teaching work. A teacher is most efficient only when he is actually engaged in Research work and keeping in touch with the latest advances in his particular subject. Even if a completely fresh start has to be made in the matter of an Agricultural College, it must be remembered that we begin with only one class and gradually work up to the full strength and activity only after three years. Thus the expenses incidental to the institution could be spread over three years and as complete an equipment as possible be obtained with a comparatively small strain on the finances of the State.

I have been led to make these remarks, after hearing about the impending establishment of an Agricultural College in Mysore and hope that these suggestions will be of some use as coming from one in intimate touch with Agricultural Education. If the Government is not prepared to face the expenditure and trouble involved in the establishment of a College worth the name, it would seem to be much better to concentrate our attention on Vernacular Agricultural Schools, somewhat of the Chikkanahalli type and see that as many schools as possible of that kind, come into being, rather than waste time and money on a second grade college.

I remain,
Yours very truly,
GUNDAPPA S. KURPAD,
Vice-Principal.

Agricultural School,
Hebbal.

NOTES AND COMMENTS.

Spraying against Coffee Black Rot or Koleroga.

In the experiments* conducted in Mr. T. Narasinga Rao's estate against coffee koleroga, reference has been made to 1% and 2% Bordeaux mixture with resin and casein adhesives. The adhesives in themselves do not act upon the fungus causing the disease, but enable the mixture to withstand the heavy rains of the monsoon.

Since the 1% mixture has been found to be quite effective the weights of the sulbstances and the amount of water to be used will be given in respect of this mixture. In the case of the 2% mixture the weight of copper sulphate and lime to be used in the mixture have to be doubled, the quantity of water remaining the same. The adhesive, however, is the same as the amount of adhesive depends only on the bulk of the mixture, that is to say, the quantity of water used in its preparation.

2½ lbs. of copper sulphate are tied in a coarse cloth or gunny bag and suspended in a wooden, earthenware, copper, or brass vessel containing 48 seers (12 gallons) of water, but capable of holding 100 seers or 25 gallons of water. Iron or zinc vessels should not be used, but they may be used for slaking lime. Two and a half pounds of quicklime (good stone-lime) are slaked first with a small quantity of water to make it into a paste, and when it has slaked well, more water is added to make it up to 48 seers (12 gallons). When the copper sulphate has all dissolved, this lime water is slowly added to the copper sulphate solution attended by constant stirring. The mixture thus made must be of a sky-blue colour. If it is well made neither copper sulphate nor lime is in excess. Usually the copper sulphate is likely to be in excess, as lime is apt to contain stones. Excess of copper sulphate may be detected by dipping the polished blade of a knife into the mixture when, after a time, the dipped end will receive a coppery deposit and appear red in colour. If this happens more lime solution should be added to it, till a polished knife blade does not take the copper deposit.

The adhesive is made with resin and soda or casein and lime.

* For detailed report on the experiment *vide* Vol. IV, No. 4 of this Journal.

The resin-soda adhesive takes a longer time in preparation. Two lbs. of resin and ½ lb. of soda ash are boiled in 4 seers or 1 gallon of water in an open kerosene tin. The soda is added when the water is boiling and then the resin. During the boiling a man should keep constantly stirring the mixture, as it froths up. When the resin completely dissolves, and the mixture becomes of the thinness of castor oil it is ready to be added to the Bordeaux mixture. This will take about ¾ hour.

The casein adhesive is easy to prepare. Half lb. casein is soaked in 2 seers or ½ gallon water so that no lumps are formed. Half lb. lime is slaked in a separate vessel with a little water, and more water to make up to 2 seers or ½ gallon is added to it. The lime water is then added to the casein accompanied by stirring. The casein completely dissolves in less than ten minutes, when it is added to the Bordeaux mixture, and it is ready for use. [S.V.V.]

* * * * *

Yield from Sprayed Plants.

Mr. T. Narasinga Rao, Coffee Planter, writes from Gallekere Estate, Bababudans, under date 23rd January 1925:

"I have just finished picking our experimental block. The four sprayed blocks (half an acre in all) have given 1240 measures of fruit, or at 75 measures a maund, 16½ mds. of coffee. The unsprayed four blocks (half an acre) have given 759 measures of fruit, or 10 maunds of coffee. So the difference is 6½ maunds of coffee for every half an acre. For one acre it is 13 maunds.....The wood in the sprayed portion for next crop is also good.

I am sorry I was not able to get separate figures for 2% and 1% mixture used."

It will be seen from the above figures that spraying is certainly worth the while. The yield of the crop does not give an adequate idea of the effect of the spraying. If to it is added the increased growth of the wood for the next cropping season the total benefit can be fully appreciated. Spraying has been rightly said by somebody to be a method of plant insurance. [S.V.V.]

* * * * *

Improvement of Dairy Cattle.

The tremendous room for improvement which exists with regard to dairy cattle in the State, is very strikingly brought out in some figures recently compiled. These figures are taken from the records maintained in connection with the cows at Rayankere Dairy Farm, and show the total amount of milk produced by some of the cows during their lifetime. Of these, one is of particular interest. Her record has been maintained since 1910, on the Bangalore Military Dairy Farm and on the Rayankere Dairy Farm after she was purchased from the former institution.

This cow produced during her several lactations about twice as much as a good Mysore cow, bore 12 calves, and was a good producer as standards go in this State and one of the best at Rayankere Dairy Farm. Her yields are given in detail in the statement appended.

And yet, in the whole of a long life, her total production was 32,640 lbs. This is about what the average good American Holstein would produce in two years, and what several cows have produced in one year.

The inference is obvious. [W.D.]

* * * * *

Organization of Manurial Experiments in Germany.

At the 45th meeting of the Union of Experimental Stations in Germany held in September 1924, Prof. Engel of Berlin delivered a very thoughtful address on the above subject. After tracing the history of the organization from the very beginning and its various stages of development, he throws out valuable suggestions for its modification according to the present needs of the country.

His suggestions are of value not only to Germany, but also to us in Mysore where the increase of agricultural production by the application of artificial manures is bound to play a very good part in the near future. We hope to give a fairly detailed summary of the address in our next number so that our members may devote some thought to the scheme and plan out something suited to our needs and means.

[B.N.I.]

Detailed Statement of Yield of Cow No. 102.

Date of calving	Date of going dry	Days in milk	Yield	Average daily yield for lactation	Days dry	Amount given in 300 days	Age at first calving	Present age	Total yield	Cow No.
June 10	24—11—10	139	1318	9.4	421					
29— 1—12	11—11—12	206	2513	8.8	219					
17— 6—13	3— 8—14	413	3105	7.8	141	2255				
25—12—14	28—10—15	303	2994	9.8	216	2970				
4— 6—16	21—12—17	257	2837	11.0	154					
26— 7—17	17— 8—18	399	3845	9.4	138					
21— 1—19	26—10—19	276	3183	11.6	71					
5— 1—20	8—12—20	303	3384	11.0	79	3351	not known	21 years	32,640 lbs.	Cow No. 102.
25— 2—21	3— 1—22	281	3138	11.0	146					
30— 4—22	8— 4—23	343	3293	9.6	101					
18— 7—23	15— 5—24	302	2043	6.7	106	2029				
30— 8—24	1— 2—25	155	987	6.3						

Necessity of Commercial Farms.

The following paragraph occurs in an article by Dr. Leake, Principal of the Imperial College of Tropical Agriculture, published in the Supplement to Tropical Agriculture, Vol. II, No. 3, March 1925.

"A common criticism of Agricultural Educational Institutions is that the product is not capable of undertaking immediately that supervision of estate work for which their training is supposed to entitle them. This criticism was more frequent in the past than it is at the present time as it comes to be recognized that an institution can only prepare a student for such work. Successful management implies skilled handling of labour and other characters which are personal to the individual and can hardly be taught, and, further, in a College with numerous students, the practical difficulties in giving each actual experience of supervisory work are insuperable. Nevertheless much can be accomplished by the attachment to such an institution of an estate worked on business lines. Such an estate must be sufficiently large to illustrate practically the common methods of working land, whether directly or indirectly, by tenantry, and it must be sufficiently large that the overhead charges bear a due relation to the other costs.

In this respect the Imperial College is at present deficient in equipment. The Savannah consisting in all of some 88 acres, will, when provision is made for buildings, hostels and recreation grounds, provide a sufficiently large cultivated area to meet the requirements for living material for the laboratories and for research but it is totally inadequate to provide an estate as defined above. Such an estate must be, under the economic conditions of the island, some 1,000 acres in extent and should embrace as far as possible the typical agricultural conditions of the island. Such an estate is not acquired and developed without considerable initial expense but this should be reproductive expenditure if the estate be run on the lines indicated. The provision of such an estate is an accepted policy of the Governors and is merely delayed by considerations of ways and means: with it a technical course, hardly second in importance to that in sugar technology, will become possible, for it is only now beginning to be recognized that there is a theory, as well as a practice, underlying estate management which will gain in importance as time progresses. It is the ambition of the

College Authorities to be first in the field within the Empire in this direction as they already are with the Sugar Factory."

The same point has been treated upon more than once in these columns, and a reform of our Agricultural Educational Institutions in the direction indicated is very urgently needed. [B.N.I.]

* * * * *

Rice Cultivation.

Messrs. Joshi and Gadkari have published an account of their work on "Studies of the Rice Plant and on Rice Cultivation".* It is a very valuable contribution to a knowledge of the subject dealt with and deserves careful study on the part of all interested in rice cultivation in this country. We publish elsewhere in this number the authors' summary of conclusions for the benefit of our readers.

[B.N.I.]

* * * * *

Our District Conferences.

The round of District conferences at which subjects relating to the economic development of our country are freely discussed by officials as well as non-officials, is now in full swing. As usual, our esteemed President and Director of Agriculture is having a busy time going from one conference to another, presiding over the agricultural sections and explaining what the departments under his control are doing for the agricultural improvement of the country. Attempts to popularize new varieties of cotton and questions relating to improvement of live-stock seem to be very keenly discussed. When the last of these for the season is over, we hope to give a consolidated account of the whole for the benefit of our readers and members. [B.N.I.]

---

* Bulletin 114 of 1923, Department of Agriculture, Bombay.

SELECTIONS.

I

The Havoc Wrought by Rats.

A report by Major Kunhardt, of the Indian Medical Service, estimates that there are at least 800 millions of rats in India, each rat consuming at least 6 lbs. of grain annually and defiling much more. Major Kunhardt estimates that in the last 20 years the loss to India is equal to £1,242,500,000, or five times India's national debt before the War, together with the death through plague of more than half a million people yearly.—*Journal of the Ministry of Agriculture* for Feb. 1925.

II

Grafting of Vegetables.

(Experiments in France.)

Grafting, a procedure quite common in tree culture, has been applied to vegetables and flowers by a French botanist, Professor Lucien Daniel, of the University of Rennes, who has by this method increased the size and yield of vegetables, created new species and prolonged the life of plants, and intensified the perfume of flowers. Professor Daniel has performed such grafting operations on cabbage, lettuce, beans, potatoes, tomatoes and various flowers.

One of the first attempts made by Professor Daniel was to graft the black Belgian bean on a large white Soissons bean. From this combination plant there were obtained seeds of an entirely new variety of beans which has remained fixed. He also took a bitter variety of cabbage unfit for food, but resistant of frosts, and grafted on it a variety that has a good flavour but succumbs easily to cold. The seeds of the hybrid yielded a new variety that tastes good and resists cold.

Some of Professor Daniel's most sensational grafts were made on the family "Solanaceœ" to which belong such useful plants as potatoes, tomatoes, tobacco and egg plant. He grafted sections of egg plant on tomato vines. First the grafts produced the regular ovoid egg-plant fruit and later on the same branch yielded other fruit resembling that of tomatoes. Finally a true hybrid, round in shape, was obtained.

Professor Daniel also grafted tomato branches and belladonna on potato vines, and potato stems on egg plants and tomato vines. Potatoes, of course, are tubers which develop underground.

It was a question as to what would happen when a potato stem was grafted on another plant. Would tubers continue to be produced ? It was found that they were, but not underground. Large beautiful tubers hung from the branches like fruit. These aerial tubers when planted yielded a new kind of underground potatoes which were more resistant and developed more quickly than those of which they were the offspring.

A still more fantastic discovery was the finding, among these second generation hybrids, of three plants which bore both aerial and subterranean tubers at the same time. These tubers being harvested and planted yielded a stable new variety rather late in developing, but delicious in flavour, extra large in size and very hardy.

One of the most recent experiments is the double grafting of belladonna and tomato. Upon a tomato stem a sprig of belladonna was grafted and then upon the latter again a tomato stem. It was found that the belladonna plant had by this operation lost its property of producing atropin poison which is normally found in all parts of the belladonna plant.—*Indian Scientific Agriculturist,* Vol. VI, No. 2.

III

Prevention of Nitrogen Losses from Cattle Urine.

The following summary of a very interesting article on the above subject is taken from the Agricultural Journal of India, Vol. XX, Part I.

Large losses of nitrogen occur when cattle urine is preserved under aerobic conditions. It was considered that it would be possible to prevent such losses if the urine could be passed over intensive nitrifying beds where it could be subjected to the rapid action of nitrifying bacteria which would convert it into nitrates before any loss takes place. Experiments were therefore undertaken to find out whether such intensive nitrifying beds could be established and whether urine would be nitrified without loss of nitrogen, and it has been found that there are two ways of accomplishing this in practice. In one the urine is passed over a nitrifying bed and ultimately recovered as a solution of nitrates. In the other method the urine is absorbed by means of a specially prepared or activated soil.

A general outline of working these processes is included in the paper to enable those interested in the subject to make their own trials.

In the first method, pumice or broken bricks serve as suitable substrata for the organisms in the nitrifying bed. The depth of layer of liquid to be nitrified possesses great influence over the nitrification process. Urine could not be nitrified directly without dilution in the nitrifying beds up till now. With the most active bed prepared so far urine requires to be diluted with ten times the quantity of water.

In the second method soil prepared by previously nitrifying some nitrogenous material in smaller quantities and washing out the nitrates is used for absorption of urine. If ordinary local soil is used for absorbing the urine directly without any such preparation large losses of nitrogen (approximately 70–80 per cent of the original amount) occur. The object of preparing the soil is to activate the nitrifying organisms and thus make the soil capable of nitrifying the high quantities of nitrogen in the urine rapidly and thus prevent losses of nitrogen which would otherwise occur. It is estimated that about 2.5 mds. of potassium nitrates. *i.e.*, pure *shora*, may be obtained from a single animal's urine (containing about 1 per cent of nitrogen) if it were converted into potassium nitrate by this process of intensive nitrification, provided no loss of nitrogen took place during handling.

Even if the crudest method of handling alone is possible for any individual resulting in 50 per cent recovery of the nitrogen in urine as nitrate, and the nitrogen content of the urine of animals be half of what was found in the case of the dairy herd at Pusa, it is estimated that 1–1¼ mds. of potassium nitrate or a manure containing an equivalent amount of nitrogen therein will be easily obtained per year if the urine of a pair of animals is regularly subjected to this process. It will be seen, therefore, that the urine of animals conserved in this way will go a long way to meet the manurial requirements of the cultivators.

IV

Erosion and Surface Run-off under Different Soil Conditions.

Duley, F.C. and Miller, N. F. *University of Missouri, Agricultural Experiment Station, Research Bulletin* No. 63.

The superficial erosion of the soil by rain produces a considerable deterioration in the quality of the land, although the losses sustained are greater or less, according to the nature of the soil and the character of the crop.

With a view to determining the extent of this loss, some experiments have been made in which the great differences between various soils have been taken into account. These experiments are of a new type, since hitherto only the losses of water-soluble substances that can be removed by bleaching have been considered.

The experiments described in the Bulletin were undertaken for the purpose of estimating accurately the amount of the erosion caused by surface run-off in the case of soils that are differently worked and cropped. The experiments were carried out for a period of six years, and the amount of the erosion was estimated in seven plots that had been worked and cultivated in a different manner.

Each plot of $\frac{1}{8}$ acre was of an elongated shape and had an average slope of 3.68%. In order to collect the water and the sediment contained in it, wells were made at the end of each plot.

The plots of ground were treated as follows :—

(1) Left uncultivated, all weeds removed, and the soil levelled ;
(2) Ploughed to a depth of 4 inches in the Spring ;
(3) Ploughed to a depth of 8 inches in the Spring ;
(4) Cultivated as a permanent pasture ;
(5) Ploughed in July to a depth of 8 inches and sown every year with wheat ;
(6) Soil ploughed to a depth of 8 inches before sowing ; Rotation of maize, wheat and clover.
(7) Sown every year with maize, ploughed in Spring to a depth of 8 inches.

The amount of water lost from every plot was estimated from the depth of the water that fell on the plot each time it rained. The quantity was found to be different on the various plots during the same year. The tables give the measurements for each of the 7 plots during each of the 6 years of the experiment.

The periods of the greatest run-off and hence of the maximum erosion, were found to be March and April, and August and September. The plots most affected were Nos. 2, 3, 4 and 6 ; more than half the total erosion took place in the above months.

The loss from erosion was greatest on the uncropped soil that had been ploughed. When the ploughing was carried to the depth of 4 inches, the maximum losses occurred, but the loss was less than 13.40% when the soil was ploughed 8 inches deep. This proves that although deep ploughing reduces losses by erosion its effect in this direction is less than might have been supposed. The losses are considerably less on land that has been both ploughed and cropped.

In the case of deeply ploughed land under maize, the losses were 50% less than in that of ploughed, but uncropped, land. Wheat reduces the losses 81% and rotations 93%.

The meadow-land lost 0.69% as compared with the uncropped land ploughed to the depth of 4 inches.

The erosion was evidently proportionate to the number of heavy rainfalls in the year. In the case studied, more than 50% of the total erosion in 5 out of the 7 plots, occurred after 16 of the heaviest rainstorms that had taken place during the 6 years.

Chemical analyses have shown that the amount of nitrogen, phosphorus, lime and sulphur lost through erosion by a soil under maize or wheat, can equal or exceed, that used by the crop. It is worthy of remark that the amount of nitrates lost is but small.

Mechanical analyses demonstrated that the material removed from uncropped, or cropped, soil contained a high percentage of sand and a low percentage of valuable material as compared with the material removed from the plots.

In estimating the value of these experiments, it is necessary to take into account the fact that they were confined to a given type of soil in a special region. Some of the conclusions are, however, of a general character thus for instance, deep ploughing has proved to have little effect in reducing erosion losses, and it has been established that the amount of water absorbed by given soils remains almost always the same, no matter how great may be the variations in the rainfall.

We may conclude by stating that wheat-growers should reduce the run-off, which has such a detrimental erosive effect, by selecting a rotation of crops that will insure the ground being covered as long as possible with vegetation. Clovers and forage gramineae are eminently suited for this purpose.—*International Review of the Science and Practice of Agriculture*, New Series, Vol. II, No. 4.

V

How America is helping the Chinese Silk Industry.

The following extracts from the speech delivered at the 52nd Annual Meeting of the Silk Association of America on June 12th, 1924, by James A. Goldsmith, the President of the Association, will give an idea to the readers of the Journal as to how America is encouraging the silk industry of China :—

"After many weeks of hard work we succeeded in raising $95,000 to be expended over a three-year period ; and that money came from a very limited group. If you had subscribed $950,000 it would not be too much, and whatever you subscribe will be returned to you manyfold.

The purpose of the sericultural fund is to assist in the development of Sericulture in all portions of the world wherever we find fertile field.

We first turn to China, the birthplace of silk. The possibility of expansion and development is unlimited. The country is enormous, with an estimated population of from three hundred to four hundred millions and with centuries of tradition as a silk-producing nation.

The rearing of silkworms requires much skill, much labour and a vast amount of science. China has the skill and the labour but little science.

The Japanese Government is fully alive to its obligations and has given every aid and assistance to its industry. The development of the Government scientific stations is magnificent. But China, alas, with its financial involvement and internal dissension, torn by strife and discord, is hopelessly at sea.

The great menace to the future of China's raw silk industry is the inroad of disease. In our travels through the country we saw many filatures closed for lack of cocoons, with a steady overhead, and consequently increased price to the consumer. The distribution of disease-free eggs throughout the land even in limited quantities will within a very few years measurably reduce the cocoon wastage.

We are fortunate in this respect to have the co-operation of missionary schools—splendid institutions, doing a wonderful work. If only from a humanitarian point of view, they are entitled to your utmost support.

We have already erected a sericultural building at Canton Christian College and through the generosity of one of our members, they have a well-equipped dormitory for the students in that Department. They have also received funds from two other members of this association for the erection of an additional building suitable for the college needs and the equipment of a cold storage plant for egg storage. All superb gifts.

We have just opened a splendid building at the University of Nanking, the gift the Silk Association of America built at a cost of $21,000 ; a building which could not be duplicated in this country for four times that figure. And we have assumed the responsibility for sericultural budgets at both of these institutions.

This is but a beginning. We are extending our work to Fukien University where we have also assumed, if not all, a large part of the sericultural burden. We have, as you know, opened a branch of our own conditioning house, the United States Testing Co., in Shanghai. If only as an educational medium, this venture should prove valuable.

Wonderful silk is grown at Fukien, in Szechuan, in Shantung. We were amazed during our trip through the Tsatlee districts at the extent of the development there, but most of this silk is unfit for use in our American mills, and for our American need modern steam Filatures must be built, and all that we can do is to educate. And that takes funds.

As far as the missionary schools are concerned I repeat they are entitled to your utmost consideration. They were the most hopeful things we saw in China. Illiteracy dominates the country and industrial development makes slow progress. What better opportunity could we have for lifting the darkness, the misery and the poverty which to-day surround this ancient civilization ?

When you stop to analyze the situation :—

When I tell you that although labour in China earns only 25% as much as similar labour in Japan yet Chinese silk cannot be produced as cheaply as Japanese because of the enormous wastage and lack of scientific knowledge and application.

When I tell you the conservative judges estimate the loss due to disease in many sections of China at 70% as against 5% to 10% in Japan.

When I tell you, you may awaken some day to the gravity of the situation only to find that you have slept too long, then perhaps you will loosen your purse strings.

And after China there are other industrial fields to conquer. Turkey before the war produced in Bursa a silk of excellent quality. Persia, Syria and the Caucasus offer splendid opportunities, but the methods in vogue are antiquated, the machinery obsolete and the task is not an easy one.

Do not expect immediate results. It may take five years, it may take ten, before we can even scratch the surface, but the day will come when our efforts will be rewarded."—*The American Silk Journal*, Vol. XLIII, No. 2.